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MICRO ELECTRO-MECHANICAL VARIABLE CAPACITOR

Abstract

A three-dimensional micro electro-mechanical (MEMS) variable capacitor is described wherein movable comb electrodes of opposing polarity are fabricated simultaneously on the same substrate are independently actuated. These electrodes are formed in an interdigitated fashion to maximize the capacitance of the device. The electrodes are jointly or individually actuated. A separate actuation electrode and a ground plane electrode actuate the movable electrodes. The voltage potential between the two electrodes provides a primary mode of operation of the device. The variation of the sidewall overlap area between the interdigitated fingers provides the expected capacitance tuning of the device. The interdigitated electrodes can also be attached on both ends to form fixed-fixed beams. The stiffness of the electrodes is reduced by utilizing thin support structures at the ends of the electrodes. The three dimensional aspect of the device avails large surface area. Large capacitance variation and tuning ranges are obtained by independent actuation of the electrode fingers. A plurality of

modes of operation of the device provides wide flexibility and greater performance advantage for the device. Upon fabrication of the device, a separate substrate with etched dielectric is used to encapsulated the device. The MEMS device is then completely encapsulated, requiring no additional packaging of the device. Further, since alignment and bonding can be done on a wafer scale, an improved device yield is obtained at a lower cost.